STRIP AE

—*A Practical Possibility? Points in Favour of the Maclaren "Crabbing" Undercarriage : Solving the Runway Problem : Successful Initial Experiments*

NOWADAYS the problems of aerodrome size and surface are taking on a very special importance. Many years ago it was considered that an area of, say, 800 yards square was sufficient for all normal purposes. To-day the accepted idea of an unobstructed runway suitable for future conditions is getting on towards 2,000 yards—and this distance, or something like it, must be available in all directions.

Quite apart from the technical difficulties involved in finding suitable areas of such dimensions within reasonable distance of the big commercial centres, the cost of buying and levelling such sites is increasing out of all proportion to the financial importance of air transport. In the meantime commercial machines are gradually becoming larger and heavier, and mere length of unobstructed runway will presently be no more important than the surface of the runway.

For these and other reasons transport operators are looking to the flying-boat for developments in really large sizes, the principle being that, in theory at least, the necessary take-off and landing runs can usually be obtained on water. At the same time this type of machine begins to show very definite advantages in the relation between structure-weight and load capacity when the size is increased beyond that which is at present considered usual. Furthermore, the larger the boat the more seaworthy it can become, and it is no longer necessary to operate only in sheltered waters.

Landplane Points

But, unfortunately, it is not quite as simple as that. Apart from the fact that it is inconvenient to operate any but long-distance services, such as those of Imperial Airways, by such means, the question of relative drag at take-off speeds becomes increasingly difficult as wing-loadings go up. Even when a boat is on the step this drag is considerably greater than that of a land undercarriage—a fact which not only provides a limit to wing and power loadings, but which also means that the engines must always be made to give their maximum power for longer periods than in the case of a landplane. Additionally, there is the slight risk of unseen obstructions in the take-off area.

So, whatever the flying-boat's virtues, the landplane will always have certain advantages and any way in which aerodrome size and surface difficulties can be overcome demands careful consideration.

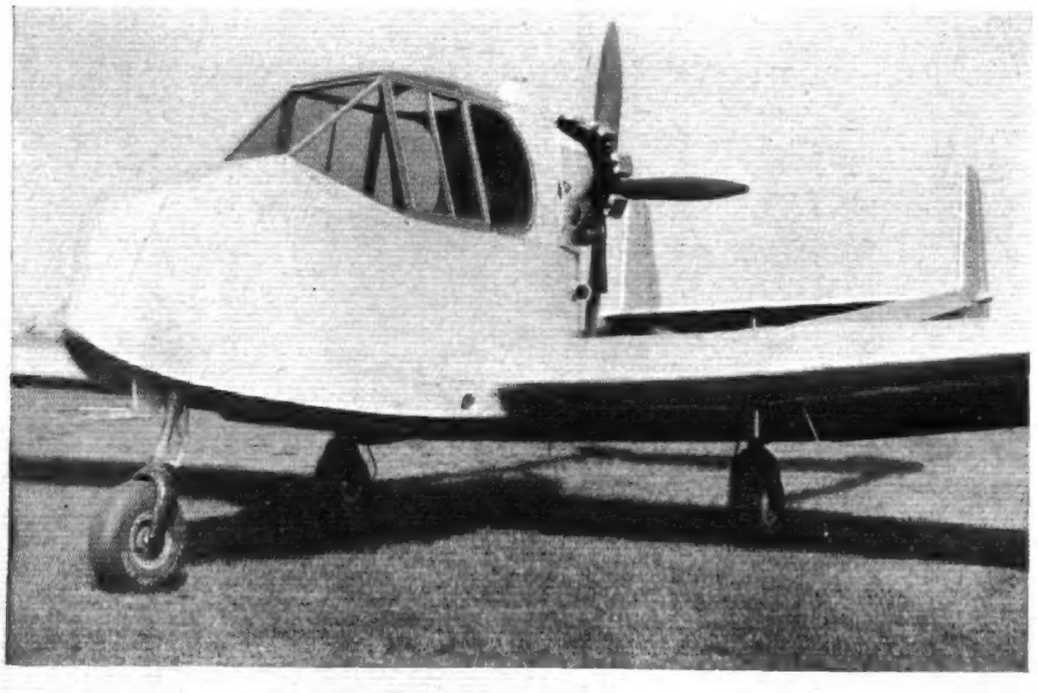
The tricycle undercarriage, by itself, has probably given the idea of a really large landplane new possibilities, and it is significant that the largest civil aircraft manufacturers in the world have fitted this type of undercarriage to their latest production. Within limits the conventional tricycle—that is, one in which the centre of gravity is forward of the main wheels—provides a certain degree of latitude in the choice of take-off and landing direction. A machine with such an undercarriage is very stable directionally and it is possible to land it slightly across wind without serious difficulty; the touch-down, however, involves a sudden swing to line the machine up with its previous flight path.

The ideal is a type of undercarriage in which all normal take-offs and landings can be made in one or two directions on a single strip. In such circumstances it would be possible and reasonable to lay out such strips, the cost of which would be very much less than the aerodromes at present required. It would become an affair of practical politics to carpet this comparatively small area with a surface which would be capable of taking the considerable loads which are now being imposed. Neither financial nor geographical considerations would prevent such a strip from being as reasonably long as the operators require. Thinking financially it is interesting to discover that a 300-yard-wide strip could have a length of nearly two miles while still covering the same area as a square aerodrome with only 1,000-yard runs.

It would seem that the only method of achieving these characteristics in an undercarriage is to arrange it so that the machine can be "crabbable" on the ground (i.e., all three wheels shall be steerable). This is the principle on which the new Maclaren undercarriage operates. The inventor's original idea was to arrange a control by which the angle of the three wheels (that in the nose, of course, remaining steerable) could be altered in the course of the landing and take-off run. A little thought, however—and Mr. O. F. Maclaren is a pilot of considerable experience—showed that this scheme, though interesting in theory, was not practical from the operational point of view. Not only would it be difficult to keep the machine on the track, but such an arrangement would give an already over-busy transport pilot at least one more control to look after.

On calculation it was found that a single selected angle for all three wheels could be used more satisfactorily, this angle being calculated and set before making the approach, or when actually in position on the runway before the take-off. The calculation of the angle would be a very simple one, and the work involved would be entirely similar to that of estimating normal drift at an air speed equivalent to that of the take-off or touch-down of the machine.

On the face of it, it might be imagined that during the take-off the correct drift angle would vary from a very wide one at the beginning of the run to a very narrow one at



The Arpin pusher on which the experiments are being carried out with an undercarriage which is directionally adjustable on the ground. In actual practice the degree of "crab" will be adjustable from the pilot's seat